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Associations between physical activity and eating-disorder psychopathology among individuals categorized with binge-eating disorder and bulimia nervosa

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Abstract

Objective: While physical activity (PA) is known to have positive effects on psychological and physical health, little is understood about the association between non-compensatory PA (i.e., not compulsive or intended to control weight or shape) and psychopathology among individuals with eating-disorder features. The present study explored associations between non-compensatory PA and psychopathology among adults categorized with bulimia nervosa (BN) and binge-eating disorder (BED). We further explored the association between compensatory PA and psychopathology among those who engaged in that form of “purging.”

Method: Participants were recruited through Mechanical Turk, an on-line recruitment platform. Individuals categorized with core features of BED ($N=138$) and BN ($N=138$) completed measures of eating-disorder psychopathology (Eating Disorder Examination – Questionnaire [EDE-Q] and Questionnaire on Eating and Weight Patterns - 5), depression (Patient Health Questionnaire - 2), and PA (both non-compensatory and compensatory, measured using the EDE-Q and Godin Leisure-Time Exercise Questionnaire).

Results: Engagement in non-compensatory PA was associated with lower frequency of binge-eating episodes, lower overvaluation of shape/weight and lower dissatisfaction with shape/weight ($p < .05$). Engagement in compensatory PA was related to greater frequency of binge-eating episodes and greater restraint ($p < .05$).

Discussion: Non-compensatory PA was associated with lower eating-disorder psychopathology. This suggests that PA is an important, though understudied, health behavior among persons with features of BED and BN. Future research should examine the potential role of non-compensatory PA in interventions for individuals with core features of these eating disorders.

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Keywords

Binge-eating disorder; bulimia nervosa; physical activity; depression; body image

Introduction

Adequate engagement in physical activity (PA) is associated with overall health and quality of life (1, 2). Additionally, across many domains, PA is associated with lower psychopathology and improved outcomes (3, 4). The association between non-compensatory PA and disordered eating, however, has been less well-studied. Concerns about driven or compulsive exercise in anorexia nervosa and as a form of inappropriate weight-compensatory “purging” behavior in bulimia nervosa (BN) (American Psychiatric, 2013) may have limited research focus on non-compensatory PA among these patient groups (5). While compulsive exercise may, in some instances, be associated with or represent a form of eating-disorder psychopathology such as purging (e.g., self-induced vomiting, laxatives; (6)), non-compensatory PA may nonetheless potentially confer important health and psychological benefits. Importantly, non-compensatory PA may also promote healthy weight control for individuals with higher body mass index (BMI), which is common among those with binge-eating disorder (BED) (7, 8) and BN (9). Healthy weight control is associated with reduced risk of cardiovascular disease, diabetes, and certain types of cancer (10). Thus, while compensatory PA may be associated with or reflect increased eating-disorder psychopathology, non-compensatory PA may be associated with decreased psychopathology in addition to health benefits that are fairly well established among other groups. Given the potential for non-compensatory PA to reduce psychological distress and promote healthy weight control, evaluating the association between non-compensatory PA and eating-disorder psychopathology among individuals with BN and BED is critical.

Many medical and psychiatric problems are observed at elevated rates among individuals with BN and BED (11). Non-compensatory PA may target certain psychopathology associated with BED and BN. For example, affective distress and dysregulation (12), body dissatisfaction (13), food cravings (14, 15), and impulsivity (16, 17) are often associated with BED and BN. PA can improve affect immediately (18, 19) and reduce affective reactivity to stressors (20). PA is also associated with improved body image among non-clinical samples (21), and has been used effectively as an adjunctive treatment for disorders marked by cravings and impulsivity, such as substance use (22, 23) and ADHD (24). However, little work has evaluated these associations between non-compensatory PA and psychopathology among individuals with core features of BED and BN.

Clinical trials have evaluated prescribed PA as an adjunct to standard treatments for BED and BN and have shown promising results. Cognitive-behavioral therapy (CBT) is the best-established treatment for BED (25, 26) and treatment of choice for adults with both BED and BN (25, 27, 28), although quite importantly it fails to produce weight loss (29, 30). Clinical trials have shown greater reductions in binge-eating frequency and associated clinical features (e.g., depression scores) and improved weight control for individuals with BED receiving recommendations to increase PA (31, 32) in addition to CBT compared to

CBT alone. Behavioral weight loss, which promotes healthy dietary changes and increases in PA, has also yielded improvements in binge-eating frequency, associated psychopathology, and weight loss, among individuals with BED (29, 30). Interventions focused on increasing non-compensatory PA have shown similarly promising improvements for weight and eating-disorder psychopathology among individuals with BN (33-35), although existing research is minimal. Thus, while there appear to be positive effects for interventions that include PA recommendations, research has yet to establish an association between non-compensatory PA and eating-disorder psychopathology among individuals with core features of BED or BN outside the context of an intervention that prescribes PA.

The present study evaluated cross-sectional associations between compensatory and non-compensatory PA and eating-disorder psychopathology, including binge-eating frequency, and depression scores. Participants were categorized with core features of BED or BN based on self-report measures. We hypothesized that engagement in non-compensatory PA would be negatively related to psychopathology while engagement in compensatory PA would be positively related to psychopathology.

Methods

Participants

Participants ($N=276$) were recruited from Mechanical Turk, an online recruitment platform that yields high-quality convenience samples. Data obtained through this service have comparable reliability and validity as data obtained from participants recruited from more traditional sources such as psychology student research pools or other internet samples (36). Samples recruited from Mechanical Turk have greater diversity in geography and demographic characteristics (such as age) than undergraduate samples (36-38). Mechanical Turk has been used in psychiatric research (39), including research on eating (40).

Participants responded to an advertisement for a survey study on eating and weight, were at least 21 years old, and spoke English or Spanish. Recruitment was limited to those who lived in the United States. Procedures were reviewed and approved by the Institutional Review Board. Individuals were included in study groups if they completed measures of PA and endorsed core features of BED ($N=138$) or BN ($N=138$) based on the Questionnaire on Eating and Weight Patterns-5 (see Table 1 for participant demographics).

Measures

Questionnaire on Eating and Weight Patterns 5 (QEWP-5).—The QEWP-5 evaluates binge-eating episode frequency (i.e., consuming an unusually large amount of food while experiencing a loss of control over eating) and compensatory behavior frequency (e.g., self-induced vomiting, laxative and diuretic misuse, compulsive exercise), as well as associated features of BED and BN as defined in the DSM-5 (41).

Eating Disorder Examination – Questionnaire (EDE-Q).—The EDE-Q measures eating-disorder psychopathology over the previous 28 days. The current study used a brief version of the EDE-Q, which, in addition to the behavioral binge-eating and purging items, comprises three subscales: Dietary Restraint (assessed using items “Have you been

deliberately trying to limit the overall amount of food you eat to influence your shape or weight (whether or not you have succeeded)?,” “Have you gone for long periods of time (8 waking hours or more) without eating anything at all in order to influence your shape or weight?,” and “Have you tried to exclude from your diet any foods that you like in order to influence your shape or weight (whether or not you have succeeded)?”, Overvaluation of weight and shape (assessed using items “Has your weight (Has your shape) influenced how you think about (judge) yourself as a person”), and Dissatisfaction of weight and shape (assessed using items “How dissatisfied have you felt about your weight (about your shape)?”). The brief version has demonstrated superior psychometric properties in nonclinical and clinical studies compared with those from the original measure (42-44).

Godin Leisure-Time Exercise Questionnaire (GLTEQ).—The GLTEQ asks individuals to report the frequency of engaging in bouts of at least 15 minutes of mild (e.g., “yoga, easy walking”), moderate (e.g., “fast walking, easy bicycling”), and strenuous (e.g., “jogging, vigorous swimming”) activity during a typical week (45). The GLTEQ has displayed adequate validity for estimating the PA level of adults (45, 46).

Patient Health Questionnaire 2 (PHQ-2).—The PHQ-2 is a two-item questionnaire that assesses depressed mood over the previous two weeks (Kroenke, Spitzer, & Williams, 2003). The PHQ-2 has a range of 0-6 where higher scores indicate greater levels of depressed mood. The PHQ-2 is a short form of the PHQ-9 and demonstrates similar psychometric properties (Kroenke, Spitzer, & Williams, 2001).

Body mass index (BMI).—Participants reported weight and height, which were used to calculate BMI.

Algorithms

Study group algorithms used QEWP-5 items (41). BED study group criteria included at least weekly binge-eating episodes over the past three months (“1 episode per week” through “14 or more episodes per week” endorsed), at least moderate distress about binge eating (“moderately” through “extremely” endorsed), and denial of weekly weight-compensatory behaviors over the past three months. BN study group criteria included at least weekly binge-eating episodes over the past three months, at least weekly compensatory behaviors over the past three months (“1 episode per week” through “14 or more episodes per week” endorsed), overvaluation of weight or shape (“Weight and shape were among the main things that affected how you felt about yourself” through “Weight and shape were the most important things that affected how you felt about yourself” endorsed), and BMI >18.5 kg/m².

To calculate non-compensatory PA frequency, number of bouts of strenuous activity on the GLTEQ was first multiplied by 4 to reflect the total estimated frequency of PA over the previous 28 days. Then, the number of episodes of compensatory exercise (measured by the EDE-Q) was subtracted from this total estimate of PA frequency to create a variable that reflected only non-compensatory PA.

Statistical analyses

SPSS version 24 was used for all analyses. Separate models tested the association of non-compensatory PA and psychopathology adjusting for study group (BED or BN). Linear and non-linear models were tested. Model selection utilized Akaike Information Criterion (AIC) to determine best fit; results of the best-fit model are presented. Interactions between non-compensatory PA and study group were tested to evaluate whether associations between non-compensatory PA and psychopathology differed by study group. Among only those participants who reported engaging in one or more episodes of compensatory PA in the previous month ($N=95$), Kendall's Tau was used to test the bivariate relationships between compensatory PA and psychopathology.

Results

Across participants, BMI was significantly associated with engagement in non-compensatory PA ($\tau = -.21, p < .001$). Adjusting for study group, non-compensatory PA was significantly associated with frequency of binge eating. Additionally, non-compensatory PA was significantly associated with overvaluation and dissatisfaction with shape/weight. Notably, these relations all represent greater engagement with non-compensatory PA being associated with lower eating-disorder psychopathology. Non-compensatory PA was not associated with depression. Further, the associations between non-compensatory PA and psychopathology did not depend on study group (i.e., there was not an interaction effect in any model; see Table 2), indicating that associations were not simply due to greater or less psychopathology between those endorsing features of BN and those endorsing features of BED.

Among individuals who reported engaging in compensatory PA (across the full study sample), the frequency of engagement in compensatory PA was significantly positively correlated with binge-eating frequency ($\tau = .24, p = .001$) and dietary restraint ($\tau = .16, p = .03$). Frequency of compensatory PA was not related to overvaluation of shape/weight ($\tau = .06, p = .43$), dissatisfaction with shape/weight ($\tau = .04, p = .61$), or depression ($\tau = -.02, p = .76$).

Discussion

This study was among the first to evaluate cross-sectional associations between non-compensatory PA and eating-disorder psychopathology in individuals endorsing core features of BED and BN. Significant associations were observed between non-compensatory PA and binge-eating frequency, overvaluation, and body dissatisfaction. Importantly, associations reflected that greater engagement in non-compensatory PA was associated with lower psychopathology. These associations highlight the possible positive role of non-compensatory PA among individuals with BN and BED.

Across participants, non-compensatory PA was associated with lower BMI. Non-compensatory PA may promote improved long-term weight control and overall health (47); however, the present study's cross-sectional design precludes any comments regarding temporal or causal associations. Our findings, like those reported earlier, that individuals

with features of BED report relatively low levels of PA compared to individuals without BED (48), suggest that research should address ways to increase non-compensatory PA as part of treatments for BED, with or without co-occurring obesity. Whether individuals who do or do not engage in compensatory exercise respond differentially to interventions that incorporate non-compensatory PA is unknown and will also be important to explore in future research.

Prior research supports that PA is related to lower psychopathology across mood and anxiety disorders (4, 49, 50). Our findings suggest that non-compensatory PA may additionally be related to lower eating-disorder psychopathology. Limitations in the current study, however, should be recognized when interpreting the findings. The present study relied on self-reported PA data which may be biased or unreliable. While PA is often overreported, among those with eating disorders it may be underreported (51). Future research should employ objectively-measured PA. The present study nonetheless indicates that perceived level of activity, after removing instances of compensatory PA, is associated with lower eating-disorder psychopathology among those with BED and BN. It may be that engagement in non-compensatory PA reduces overvaluation of shape or weight by building efficacy in other important domains or reduces body dissatisfaction by improving weight control.

Additionally, it is possible that non-compensatory PA reduces affective distress or appetitive cues that could precipitate binge eating. However, it is important to note that lower eating-disorder psychopathology may additionally impact PA (e.g., individuals with lower body dissatisfaction may engage in more non-compensatory PA due to lower concern with others seeing them engage in activity). Given that the cross-sectional nature of this study precludes directional interpretations, future research should evaluate whether increases in non-compensatory PA reduce eating-disorder psychopathology or whether reductions in eating-disorder psychopathology increase PA.

Other measures were also self-report and we were unable to administer clinical interviews to determine formal diagnoses (e.g., differentiating between diagnostic groups). However, self-report may help individuals disclose sensitive matters with greater honesty because of the anonymity they provide. Moreover, Mechanical Turk as a recruitment platform allowed us to draw from the entire United States and include a broad age range, while also benefiting from the excellent reliability and validity documented for participants recruited from this site (37). Additionally, while self-reported weight and height are known to be biased, these values are correlated with measured height and weight and are widely used to estimate health risk in national epidemiological samples (52). Importantly, the degree of discrepancy between self-reported weight and measured weight is not associated with eating-disorder pathology (53). Participants in the current study largely identified as White and highly educated. Whether individuals of different racial/ethnic identity, or different education levels experience a different association between non-compensatory and compensatory PA and disordered eating behaviors is unknown.

Despite these limitations, this study was a critical next step in understanding non-compensatory PA in individuals with BED and BN. The present findings suggest that non-compensatory PA may be associated with less psychopathology among individuals with BED and BN outside the context of an intervention. Results expand on evidence from

treatment studies that included PA recommendations and found that non-compensatory PA may be associated with improved psychological functioning among individuals with these disorders. Future work should build on the present study, evaluating temporal associations between non-compensatory PA and behavioral and psychological characteristics of BED and BN, utilizing objective measurements to better assess the constructs of interest, and establishing recommendations (e.g., duration, frequency, intensity) for non-compensatory PA within treatment.

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References

1. Reiner M, Niermann C, Jekauc D, Woll A. Long-term health benefits of physical activity—a systematic review of longitudinal studies. *BMC public health*. 2013;13(1):813. [PubMed: 24010994]
2. Warburton DE, Nicol CW, Bredin SS. Health benefits of physical activity: the evidence. *Canadian medical association journal*. 2006;174(6):801–9. [PubMed: 16534088]
3. Penedo FJ, Dahn JR. Exercise and well-being: a review of mental and physical health benefits associated with physical activity. *Current opinion in psychiatry*. 2005;18(2):189–93. [PubMed: 16639173]
4. Ströhle A. Physical activity, exercise, depression and anxiety disorders. *Journal of neural transmission*. 2009;116(6):777. [PubMed: 18726137]
5. Quesnel DA, Libben M, Caperchione CM. Preliminary assessment criteria for prescribing exercise when treating eating disorders: What do the experts have to say? *Mental Health and Physical Activity*. 2018.
6. Lydecker JA, Shea M, Grilo CM. Driven exercise in the absence of binge eating: Implications for purging disorder. *International Journal of Eating Disorders*. 2018;51(2):139–45. [PubMed: 29215743]
7. de Zwaan M. Binge eating disorder and obesity. *International Journal of Obesity*. 2001;25(S1):S51. [PubMed: 11466589]
8. Udo T, Grilo CM. Prevalence and correlates of DSM-5–defined eating disorders in a nationally representative sample of US adults. *Biological psychiatry*. 2018;84(5):345–54. [PubMed: 29859631]
9. Masheb R, White MA. Bulimia nervosa in overweight and normal-weight women. *Comprehensive psychiatry*. 2012;53(2):181–6. [PubMed: 21550028]
10. Kopelman P. Health risks associated with overweight and obesity. *Obesity reviews*. 2007;8:13–7. [PubMed: 17316295]
11. Udo T, Grilo CM. Psychiatric and medical correlates of DSM-5 eating disorders in a nationally representative sample of adults in the United States. *International Journal of Eating Disorders*. 2019;52(1):42–50. [PubMed: 30756422]
12. Berner LA, Crosby RD, Cao L, Engel SG, Lavender JM, Mitchell JE, et al. Temporal associations between affective instability and dysregulated eating behavior in bulimia nervosa. *Journal of psychiatric research*. 2017;92:183–90. [PubMed: 28482293]
13. Johnson F, Wardle J. Dietary restraint, body dissatisfaction, and psychological distress: a prospective analysis. *Journal of abnormal psychology*. 2005;114(1):119. [PubMed: 15709818]
14. Ng L, Davis C. Cravings and food consumption in binge eating disorder. *Eating behaviors*. 2013;14(4):472–5. [PubMed: 24183139]

15. Waters A, Hill A, Waller G. Bulimics' responses to food cravings: is binge-eating a product of hunger or emotional state? *Behaviour Research and Therapy*. 2001;39(8):877–86. [PubMed: 11480829]
16. Rosval L, Steiger H, Bruce K, Israël M, Richardson J, Aubut M. Impulsivity in women with eating disorders: problem of response inhibition, planning, or attention? *International Journal of Eating Disorders*. 2006;39(7):590–3. [PubMed: 16826575]
17. Schag K, Schönleber J, Teufel M, Zipfel S, Giel K. Food-related impulsivity in obesity and Binge Eating Disorder—a systematic review. *Obesity Reviews*. 2013;14(6):477–95. [PubMed: 23331770]
18. Kanning M, Schlicht W. Be active and become happy: an ecological momentary assessment of physical activity and mood. *Journal of Sport and Exercise Psychology*. 2010;32(2):253–61. [PubMed: 20479481]
19. Liao Y, Shonkoff ET, Dunton GF. The acute relationships between affect, physical feeling states, and physical activity in daily life: a review of current evidence. *Frontiers in Psychology*. 2015;6:1975. [PubMed: 26779049]
20. Piazza JR, Charles ST, Sliwinski MJ, Mogle J, Almeida DM. Affective reactivity to daily stressors and long-term risk of reporting a chronic physical health condition. *Annals of Behavioral Medicine*. 2012;45(1):110–20.
21. Hausenblas HA, Fallon EA. Exercise and body image: A meta-analysis. *Psychology and Health*. 2006;21(1):33–47.
22. Ussher M, Sampuran AK, Doshi R, West R, Drummond DC. Acute effect of a brief bout of exercise on alcohol urges. *Addiction*. 2004;99(12):1542–7. [PubMed: 15585045]
23. Haasova M, Warren FC, Ussher M, Janse Van Rensburg K, Faulkner G, Copley M, et al. The acute effects of physical activity on cigarette cravings: systematic review and meta-analysis with individual participant data. *Addiction*. 2013;108(1):26–37. [PubMed: 22861822]
24. Gapin JI, Labban JD, Etnier JL. The effects of physical activity on attention deficit hyperactivity disorder symptoms: The evidence. *Preventive Medicine*. 2011;52:S70–S4. [PubMed: 21281664]
25. Grilo CM. Psychological and Behavioral Treatments for Binge-Eating Disorder. *The Journal of clinical psychiatry*. 2017;78:20–4. [PubMed: 28125175]
26. Hilbert A, Petroff D, Herpertz S, Pietrowsky R, Tuschen-Caffier B, Vocks S, et al. Meta-analysis of the efficacy of psychological and medical treatments for binge-eating disorder. *Journal of consulting and clinical psychology*. 2019;87(1):91. [PubMed: 30570304]
27. Hay PP, Bacaltchuk J, Stefano S, Kashyap P. Psychological treatments for bulimia nervosa and bingeing. *Cochrane database of systematic reviews*. 2009(4).
28. National Institute for Health Care Excellence. Eating disorders: Recognition and treatment: NICE Guideline (NG69); 2017.
29. Grilo CM, Masheb RM, Wilson GT, Gueorguieva R, White MA. Cognitive-behavioral therapy, behavioral weight loss, and sequential treatment for obese patients with binge-eating disorder: A randomized controlled trial. *Journal of consulting and clinical psychology*. 2011;79(5):675. [PubMed: 21859185]
30. Wilson GT, Wilfley DE, Agras WS, Bryson SW. Psychological treatments of binge eating disorder. *Archives of general psychiatry*. 2010;67(1):94–101. [PubMed: 20048227]
31. Blanchet C, Mathieu M-È, St-Laurent A, Fecteau S, St-Amour N, Drapeau V. A Systematic Review of Physical Activity Interventions in Individuals with Binge Eating Disorders. *Current obesity reports*. 2018;7(1):76–88. [PubMed: 29460067]
32. Vancampfort D, Vanderlinden J, De Hert M, Adamkova M, Skjaerven LH, Catalán-Matamoros D, et al. A systematic review on physical therapy interventions for patients with binge eating disorder. *Disability and rehabilitation*. 2013;35(26):2191–6. [PubMed: 23594056]
33. Sundgot-Borgen J, Rosenvinge JH, Bahr R, Schneider LS. The effect of exercise, cognitive therapy, and nutritional counseling in treating bulimia nervosa. *Medicine & Science in Sports & Exercise*. 2002.
34. Vancampfort D, Vanderlinden J, De Hert M, Soundy A, Adámkova M, Skjaerven LH, et al. A systematic review of physical therapy interventions for patients with anorexia and bulimia nervosa. *Disability and rehabilitation*. 2014;36(8):628–34. [PubMed: 23826882]

35. Mathisen TF, Bratland-Sanda S, Rosenvinge JH, Friberg O, Pettersen G, Vrabel KA, et al. Treatment effects on compulsive exercise and physical activity in eating disorders. *Journal of eating disorders*. 2018;6(1):43. [PubMed: 30559966]
36. Behrend TS, Sharek DJ, Meade AW, Wiebe EN. The viability of crowdsourcing for survey research. *Behavior Research Methods*. 2011;43:800–13. [PubMed: 21437749]
37. Buhrmester M, Kwang T, Gosling SD. Amazon’s Mechanical Turk: A new source of inexpensive, yet high-quality, data? *Perspectives on Psychological Science*. 2011;6:3–5. [PubMed: 26162106]
38. Hauser DJ, Schwarz N. Attentive Turkers: MTurk participants perform better on online attention checks than do subject pool participants. *Behavior Research Methods*. 2016;48:400–7. [PubMed: 25761395]
39. Price M, Legrand AC, Brier ZMF, Hébert-Dufresne L. The symptoms at the center: Examining the comorbidity of posttraumatic stress disorder, generalized anxiety disorder, and depression with network analysis. *Journal of Psychiatric Research*. 2019;109:52–8. [PubMed: 30502492]
40. Boswell RG, Sun W, Suzuki S, Kober H. Training in cognitive strategies reduces eating and improves food choice. *Proceedings of the National Academy of Sciences*. 2018;115(48):E11238–E47.
41. Yanovski SZ, Marcus MD, Wadden TA, Walsh BT. The Questionnaire on Eating and Weight Patterns-5: An updated screening instrument for binge eating disorder. *International Journal of Eating Disorders*. 2015;48(3):259–61. [PubMed: 25545458]
42. Grilo CM, Henderson KE, Bell RL, Crosby RD. Eating disorder examination-questionnaire factor structure and construct validity in bariatric surgery candidates. *Obesity surgery*. 2013;23(5):657–62. [PubMed: 23229951]
43. Grilo CM, Reas DL, Hopwood CJ, Crosby RD. Factor structure and construct validity of the eating disorder examination-questionnaire in college students: Further support for a modified brief version. *International Journal of Eating Disorders*. 2015;48(3):284–9. [PubMed: 25346071]
44. Machado PP, Grilo CM, Crosby RD. Replication of a Modified Factor Structure for the Eating Disorder Examination-Questionnaire: Extension to Clinical Eating Disorder and Non-clinical Samples in Portugal. *European Eating Disorders Review*. 2018;26(1):75–80. [PubMed: 29152813]
45. Godin G The Godin-Shephard leisure-time physical activity questionnaire. *The Health & Fitness Journal of Canada*. 2011;4(1):18–22.
46. Amireault S, Godin G. The Godin-Shephard leisure-time physical activity questionnaire: validity evidence supporting its use for classifying healthy adults into active and insufficiently active categories. *Perceptual and motor skills*. 2015;120(2):604–22. [PubMed: 25799030]
47. Blair SN. Physical inactivity: the biggest public health problem of the 21st century. *British journal of sports medicine*. 2009;43(1):1–2. [PubMed: 19136507]
48. Carr MM, Lydecker JA, White MA, Grilo CM. Examining physical activity and correlates in adults with healthy weight, overweight/obesity, or binge-eating disorder. *International Journal of Eating Disorders*. 2019.
49. Martinsen EW. Physical activity in the prevention and treatment of anxiety and depression. *Nordic journal of psychiatry*. 2008;62(sup47):25–9.
50. Mata J, Thompson RJ, Jaeggi SM, Buschkuhl M, Jonides J, Gotlib IH. Walk on the bright side: physical activity and affect in major depressive disorder. *Journal of abnormal psychology*. 2012;121(2):297. [PubMed: 21553939]
51. Bratland-Sanda S, Sundgot-Borgen J, Rø Ø, Rosenvinge JH, Hoffart A, Martinsen EW. “I’m not physically active-I only go for walks”: Physical activity in patients with longstanding eating disorders. *International Journal of Eating Disorders*. 2010;43(1):88–92. [PubMed: 19728373]
52. Stommel M, Schoenborn CA. Accuracy and usefulness of BMI measures based on self-reported weight and height: findings from the NHANES & NHIS 2001-2006. *BMC public health*. 2009;9(1):421. [PubMed: 19922675]
53. White MA, Masheb RM, Grilo CM. Accuracy of self-reported weight and height in binge eating disorder: Misreport is not related to psychological factors. *Obesity*. 2010;18(6):1266–9. [PubMed: 19834465]

What's already known about this topic?

- Engagement in physical activity is associated with better physical and psychological health
- Individuals with excess weight and those with binge-eating disorder engage in relatively low levels of physical activity
- Research on non-compensatory physical activity among individuals with bulimia nervosa may have been limited by concern regarding excessive or weight-compensatory exercise

What does this article add?

- Across individuals with binge-eating disorder and bulimia nervosa, engagement in non-compensatory physical activity is associated with lower eating-disorder psychopathology
- Compensatory physical activity is associated with higher eating-disorder psychopathology
- Evidence suggests that non-compensatory physical activity may be beneficial, though understudied, among these patient groups

Table 1.

Participant characteristics

	BED (<i>n</i> = 138)	BN (<i>n</i> = 138)
Age (years), <i>M</i> (<i>SD</i>)	34.42 (10.01)	32.43 (10.13)
Female, <i>n</i> (%)	98 (71.0)	103 (74.6)
Hispanic, <i>n</i> (%)	29 (21.0)	41 (29.7)
Race, <i>n</i> (%)		
White	115 (83.3)	107 (77.5)
Black/African-American	6 (4.3)	8 (5.8)
Asian	4 (2.9)	8 (5.8)
More than one race	6 (4.3)	5 (3.6)
Other	7 (5.0)	10 (7.2)
Education, <i>n</i> (%)		
High school or less	15 (10.9)	23 (16.7)
Some college	52 (37.7)	44 (31.9)
College degree	50 (36.2)	48 (34.8)
More than college	21 (15.2)	23 (16.7)
BMI, <i>M</i> (<i>SD</i>)	32.79 (7.99)	29.66 (7.97)
Frequency of physical activity (in a typical week), <i>M</i> (<i>SD</i>)		
Non-compensatory (GLTEQ – EDE-Q)	2.49 (4.97)	4.69 (7.66)
Compensatory (EDE-Q)	0.73 (3.31)	6.39 (9.07)
Eating disorder psychopathology (EDE-Q), <i>M</i> (<i>SD</i>)		
Restraint	2.85 (1.89)	3.74 (1.88)
Overvaluation of shape/weight	4.41 (1.46)	4.67 (1.47)
Dissatisfaction with shape/weight	4.72 (1.53)	4.72 (1.56)
Binge-eating episodes in the past month (EDE-Q), <i>M</i> (<i>SD</i>)	6.25 (6.41)	8.29 (9.63)
Depression (PHQ-2), <i>M</i> (<i>SD</i>)	2.67 (1.85)	3.23 (2.00)

Table 2.

Associations between non-compensatory PA and psychopathology

	B	SEb	Test statistic	P
Binge-eating frequency				
Study group	-0.33	0.13	-0.58	.01
PA	-0.03	0.01	9.28	< .01
Restraint over eating				
Study group	-0.87	0.23	14.37	< .01
PA	0.01	0.02	0.43	.51
Overvaluation of weight and shape				
Study group	-0.33	0.18	3.40	.07
PA	-0.03	0.01	3.87	< .05
Dissatisfaction with weight and shape				
Study group	-0.06	0.19	0.11	.74
PA	-0.03	0.01	4.76	.03
Depression				
Study group	-0.56	0.23	5.76	.02
PA	0.00	0.02	0.01	.94